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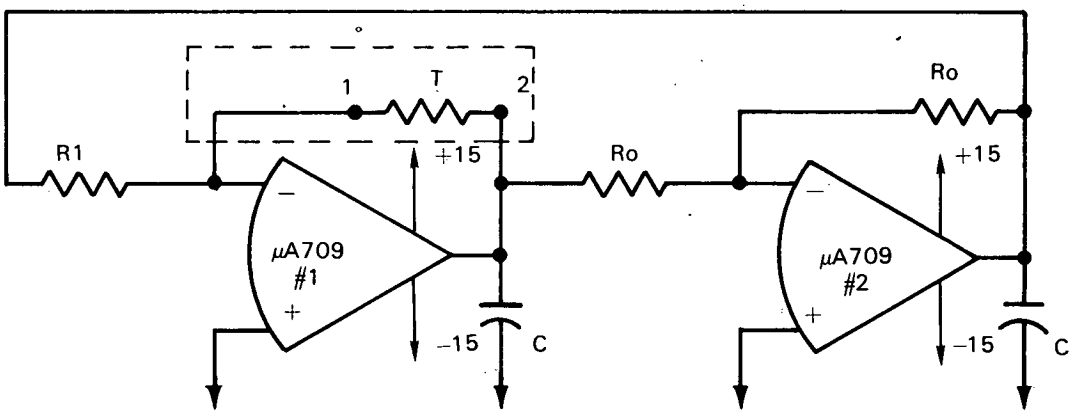
Brief 69-10507

NASA TECH BRIEF

Radiometric Temperature Reference



The problem:

In the measurement of infrared radiation an internal calibration source or reference of a known, fixed radiation level is required to provide quantitative information. Frequently, the reference radiation must be made large with respect to that from the sample being measured. Thus, a reference source is desired that is simple, rugged, and capable of high temperature operation.

The solution:

A Radiometric Temperature Reference (RTR) has been designed that uses a thermistor as both heating and sensing element to maintain its resistance at a level that is preselected to continuously control the power supplying it.

How it's done:

The mechanical configuration of the thermistor assembly and the electronic control circuit are shown on the above figure. Although the circuit uses a minimum of components, it is theoretically capable of maintaining selected temperatures to within the temperature-resistance repeatability figures of state-of-the-art thermistors. With components as shown the circuit is sensitive enough to drive the thermistor at saturation voltage with an instantaneous 0.01% change of the thermistor resistance. For this reason, the thermistor must be thermally isolated from its environment, its thermal mass must be increased, or the system must be electronically damped to prevent oscillations.

The operating temperature of the RTR is controlled by varying the value of R1 at the input of operational amplifier #1 which is operating in a constant current configuration. Operational amplifier #2 operates in a unity gain mode and inverts the signal polarity for positive feedback through resistor R1. When the circuit is energized, the resistance value of R1 is less than the resistance of the thermistor (T), establishing a gain greater than unity. Under this condition the voltage across the thermistor increases until it approximates the power supply voltage. This voltage heats the thermistor until its resistance is approxi-

(continued overleaf)

mately equal to R1 and then decreases to a value necessary to maintain resistance equilibrium.

Notes:

Documentation is available from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: TSP69-10507

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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